

FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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CONTENTS.

	PAGE
Editorial Comment:	
The Flying Services Fund	35
The "Industrial Army" Badge	35
Protection from Enemy Aircraft	36
The British Air Service	36
Tractor v. Propeller. By Fregata	38
Aircraft Work at the Front	39
Hydromechanic Experiments with Flying Boat Hulls. By H. C. Richardson	40
Royal Aero Club. Official Notices	44
From the British Flying Grounds	44
Correspondence	45
Enemy Patents Relating to Aeronautics	45
"Propeller Flutter"	46
Eddies. By "Æolus"	47
Aircraft and the War	48
Models. Edited by V. E. Johnson, M.A.	51

EDITORIAL COMMENT.

The Flying Services Fund.

Having been among those who urged the members of the Royal Aero Club to take the masterly action of supporting the Flying Services Fund it is organising with the substantial contribution of £1,000 from its own funds, we are glad to find that we are not alone in regarding the step as one of the wisest that has been taken in the history of the Club. Thus, Mr. Gerald Biss, in the *Standard*, considers that "it is in keeping with the splendid large-minded policy of the Royal Aero Club from the first days of the real start of aviation, throughout which it shows such a fine and consistent record. Moreover, in its official position, directly commissioned and recognised by the Government, it gives the Club more weight; and with such a good and substantial start it can go to the public in a position to command, if not to demand, generous support in such a cause."

Still further in agreement with *FLIGHT*, Mr. Biss goes on to remark that "despite the many calls upon private purses so generously responded to, despite straitened conditions and necessarily heavy taxation all round, I have no doubt that the response will be prompt and

adequate when the public is given its chance, as it will be shortly. It must first recognise clearly how much the Royal Aero Club has done for years out of its very limited resources, and that it is now its turn to do its share; and then it must consider what aviation, officially despised and retarded until quite recently, has done in this war, in which we in this, the newest branch of warfare, promptly 'established a personal ascendancy.'"

It but remains for the organisers of the Fund to push forward their claims throughout the entire Press of the country and by every other legitimate means, and to reap the harvest on behalf of our flying services which awaits their appeal. This, we understand, will be done shortly by the Chairman of the Royal Aero Club, the Marquess of Tullibardine.

The "Industrial Army" Badge.

It will be remembered that during the course of last month we devoted considerable space to urging the Government to undertake the issue of some form of official badge which those engaged either in the Government service or in that of privately-owned establishments upon the production of material and equipment for our Navy and Army could wear, in order to indicate to the public that, although not in khaki, they were none the less fully serving their country in this time of national crisis.

That the need for such a badge is still as great as ever is evidenced by the wording of some of the posters that have been issued with the object of assisting the work of recruiting officers up and down the country. We quote but a couple of the questions from the many on one of the posters:—

"What will you say in years to come when people ask you—'Where did you serve in the great war?'"

"What would happen to the Empire if every man stayed at home like you?"

While such questions may bring a few of the available young men who have not joined the colours to a realisation of their duty, they certainly act as unnecessary pin-pricks and disturbing elements to those men who, while within the military age limits, are, as Lord Kitchener and the Board of Admiralty have pointed out, by sticking to their jobs in the workshops and factories engaged on the production of war material and supplies, doing equally as vital work as our splendid forces in the trenches.

So far as the Royal Aircraft Factory is concerned, the

issue of such a badge to the employees, as our readers are aware, was undertaken some time ago, and as regards the men employed by private firms, we are glad to learn that the Admiralty have done their part in this direction, they having recently issued the official badge, a photograph



of which we reproduce, to firms who are engaged on work for the Navy. This badge is of the simplest possible character, the words "On War Service, 1914" being inscribed on a blue ground, encircling the Royal Crown. This action was what was wanted, and it should be generally noted that all men wearing this little emblem are to be respected every bit as much as their brother patriots who are serving in the active army. The only regret is that this badge was not issued a little earlier, as many firms, in protection of their employees, had already designed and issued to the men badges of a similar character, and the substitution of the Navy Badge must necessarily entail a pecuniary loss under the circumstances. This is, however, after all, but a minor matter, and we hope that this good lead of the Navy may induce a similar step by the War Office.

Every possible step should, as we have before suggested, be taken to see that these official badges are not abused, that is to say, that they are only issued to, and worn by, men properly entitled to them—men who are directly or indirectly engaged on maintaining the fighting efficiency

of our Army and Navy. They should also remain the property of the Government as is rightly specified by the Admiralty in issuing their badge, it being an obligation on each firm to see that they are returned immediately any employee ceases to be engaged on work for the Empire's fighting needs.

The Protection from Enemy Aircraft.

The activity which the Germans have shown during the past week in connection with their aircraft fleet—both airships and aeroplanes—in the neighbourhood of the Belgian coast, has led some people to fear that the long-threatened aerial invasion of London was approaching its fulfilment. It would, indeed, be rash for us to assert that no such visits will be paid, for, given favourable climatic conditions, they are undoubtedly possible. Our elaborate defensive preparations which have been made may, however, be expected to act as a deterrent, for there is no doubt that any such attempt would be attended with great risks, and would accomplish nothing that could have any definite influence on the progress of the war.

It is satisfactory to note that the majority of the London public have come to regard the possibility of menace from the air with equanimity, the only thing for them to remember, as the New Scotland Yard Order recently advised, being for them to leave the streets and upper storeys of buildings whenever any explosions in the air are heard.

Should the Zeppelins attempt to visit the Metropolis, they may be assured of a warm welcome. In every direction are the authorities prepared as a result of the inauguration three months ago of a special corps known as the Anti-Aircraft Corps, whose duty it is to assist in working the country's anti-aircraft guns and searchlights. The special constables working the searchlights volunteered almost *en masse* for the new duty, and there are now some 800 officers and men employed in this section of the Royal Naval Air Service, drills being carried out night and day at all the searchlight and gun stations.

THE BRITISH AIR SERVICES.

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

Royal Naval Air Service.

THE following were announced by the Admiralty on the 4th inst :

The following have been entered as Flight Sub-Lieutenants, with seniority Jan. 4th, and appointed to the "Pembroke III" for Royal Naval Air Service: C. E. Wood, E. de Courcey Hallifax, C. Johnson, G. W. Hilliard, R. C. Potter and R. H. Routledge.

Temporary Surgeon G. C. Scott, M.D., to the "Pembroke III," for Royal Naval Air Service. To date Dec. 31st.

The following was announced by the Admiralty on the 8th inst :—Mr. Arthur V. Tabor has been entered as Probationary Flight Sub-Lieutenant with seniority of Jan. 6th, and appointed to the "Pembroke III" for R.N. Air Service. Jan. 11th.

The following was announced by the Admiralty on the 9th inst. :—Flight Sub-Lieuts. A. F. Bettington, T. Spencer, F. G. Andreaa, and W. H. Elliott (for temporary service), all to the "Pembroke III," additional, for R.N. Air Service. To date Jan. 1st.

The following was announced by the Admiralty on the 11th inst. :—Lieut.-Commander A. M. Longmore, promoted to the rank of Acting Commander, with seniority Jan. 5th.

Temporary Surgeon A. L. Dykes, M.D., to the "Pembroke III," for Naval Air Service. To date Jan. 9th.

Royal Flying Corps (Military Wing).

THE following appeared in a supplement to the *London Gazette* issued on the 6th inst. :—

Special Reserve. Supplementary to Regular Corps.—Second Lieuts. (on probation) confirmed in their rank: Cyril M. Crowe, Geoffrey H. Eastwood.

The following appeared in a supplement to the *London Gazette* issued on the 7th inst. :—

Lieut. Frederick A. Wanklyn, R.A., from Officer in Charge of Transport (graded as Flight Commander), Central Flying School, to be a Flight Commander, and to be temporary Captain. Nov. 26th, 1914.

The following appeared in a supplement to the *London Gazette* issued on the 11th inst. :—

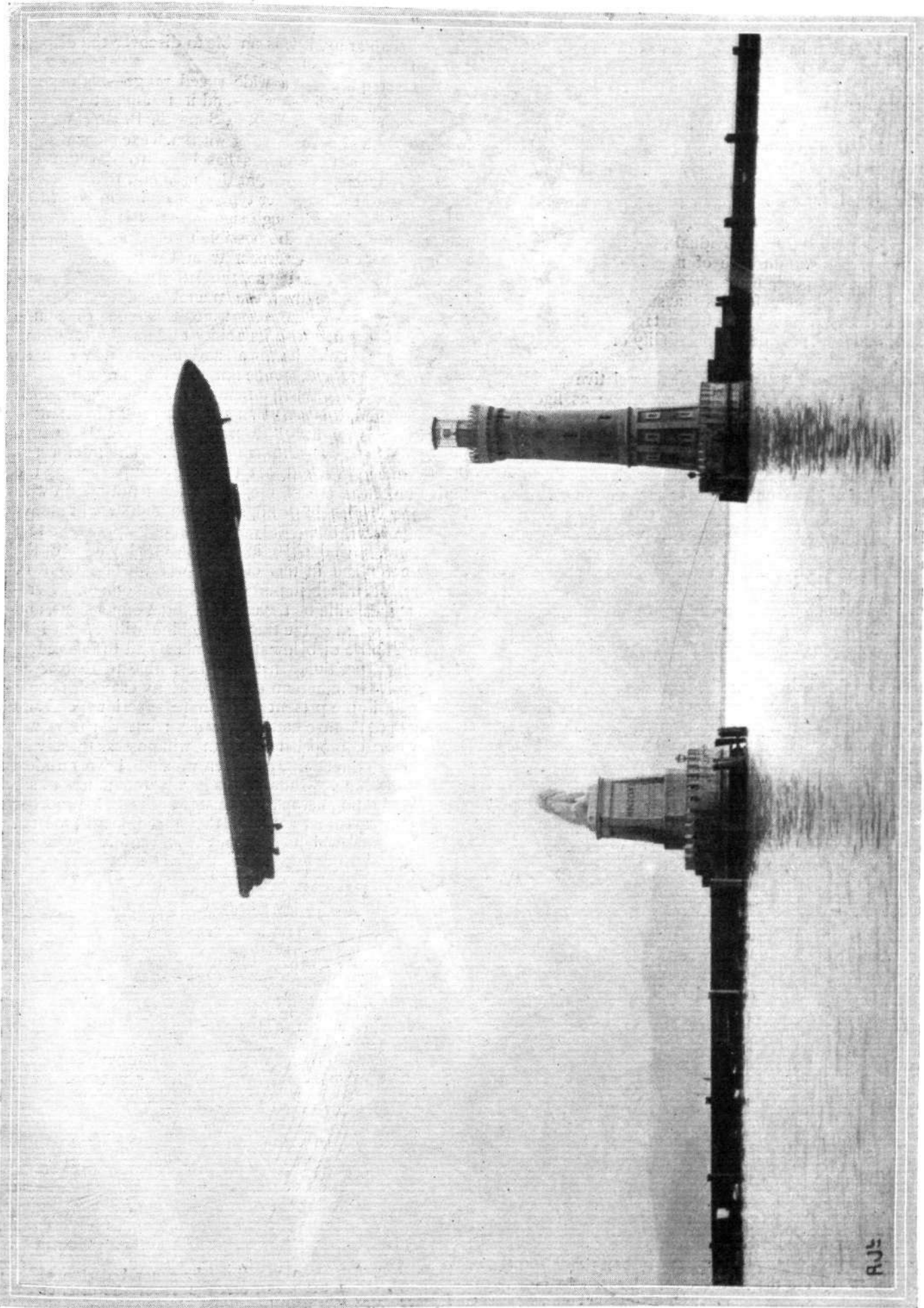
Second Lieuts. *Special Reserve*, to be Flying Officers—Dec. 18th, 1914: Arthur M. Wynne, Thomas F. D. R. Aikman.

Special Reserve. Supplementary to Regular Corps.—Geoffrey Harold Brinkman McCall to be Second Lieutenant (on probation). Dated Dec. 20th, 1914.

The following appeared in the *London Gazette* issued on the 12th inst. :—

The undermentioned appointments are made :—Flying Officers—Dated Dec. 22nd, 1914: Lieut. E. O. Grenfell, 5th Battalion the Duke of Cornwall's Light Infantry; Second Lieut. Cyril M. Crowe, *Special Reserve*; and Second Lieut. Geoffrey H. Eastwood, *Special Reserve*.

Frank Bernard Halford, Aeronautical Inspection Department, to be an Inspector of Aeronautical Material, for employment with the Royal Flying Corps, and is granted the honorary rank of Lieutenant whilst so employed. Dated Dec. 18th, 1914.



IN THE DAYS OF PEACE.—A Zeppelin over Lindau Harbour, Lake Constance, below Friedrichshafen, where the British raid on the Zeppelin works was made.

TRACTOR v. PROPELLER.

By "FREGATA."

MUCH speculation has been going on as to the probable changes that the lessons learned during this war will bring about in the design of aeroplanes. In every branch of aerial warfare—reconnaissance, observation of gunfire, fighting in the air, bomb-dropping, the transport of officers and men from point to point on the field of battle, &c.—much experience has been gained; but it is hardly to be expected that the authorities should publish broadcast, at the present moment, any such valuable information at their disposal. Hence any opinion that may be expressed by an individual as to the utility or superiority of a certain type of machine over another for a specific purpose, must necessarily be a personal one, and it by no means follows that such an opinion may not be modified when all the circumstances and facts are available and thus provide the possibility of seeing things in a new perspective.

This is especially so in regard to the relative position of tractor and propeller types of aeroplane as fighting machines, which is often discussed to the detriment of the former, in my opinion, unfairly. Up to the present time, with comparatively few exceptions, constructors have concentrated their attention on the development of the aeroplane for observation purposes; and rightly so, since it is in this particular sphere that the aeroplane has been, and will still continue to be, pre-eminently successful.

The fighting machine has not been neglected; but it has been given a secondary place, because its essential function is to combat the operations of the observation aeroplane.

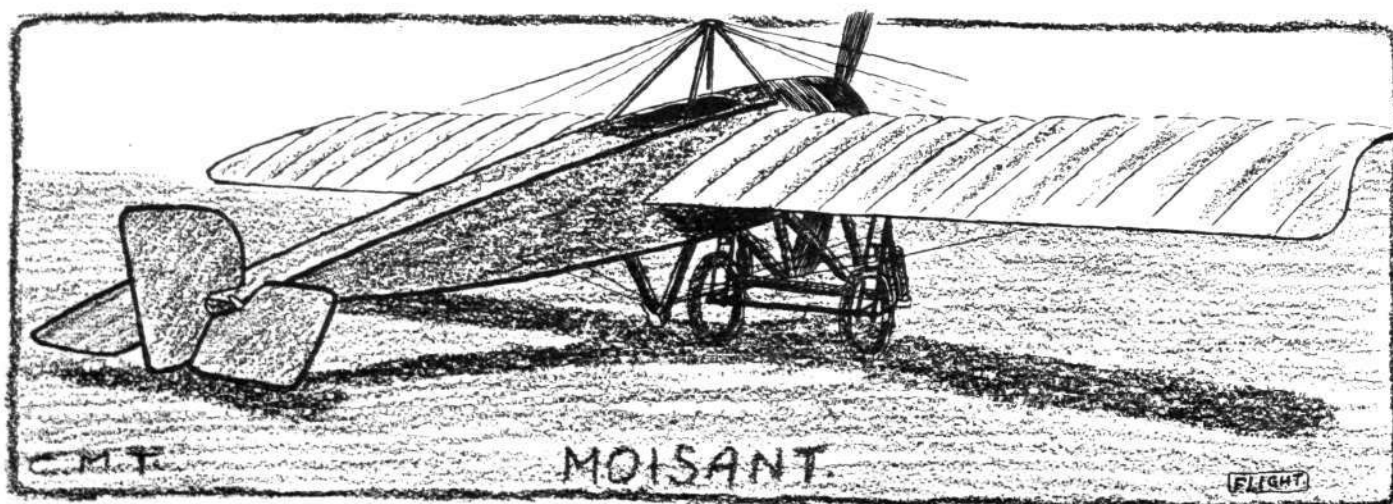
Now, in reconnaissance, speed introduces two warring factors. High speed enables the pilot to get from place to place and return to an assigned place for the purpose of transmitting the information he has gained in the shortest possible time. High speed also spells safety, since in the event of an attack from hostile aircraft, the scout can the more readily out-distance his pursuers. On the other hand, high speed, unless accompanied by a wide speed range, renders effective and exact observation much more difficult of accomplishment, and it may well happen that a reconnaissance may prove to be a positive

danger to an army, if it is unable to discover the dispositions of the enemy's forces.

What is required is, a wide speed range—high speed, with the ability to fly slowly—and it is along these lines that such firms as A. V. Roe, Sopwith, Bristol, Vickers and others have been working with such excellent results. The result of their efforts has been to develop the tractor aeroplane, because, at the moment, this machine is superior to the propeller type of machine in regard to its speed qualities, although signs are not lacking that in the near future it will be possible to obtain equally good performances in this respect from the "pusher" aeroplanes. And if this be so, the latter will have an undoubted advantage over the tractor machine, as it is the uninterrupted field of view which this type of machine possesses combined with its ability to fly slowly that have enabled it to hold its own and caused it to be so successful in reconnaissance and observation.

When, therefore, the requirements of a fighting machine are considered, it is seen that speed is most important—the fighter is an aerial destroyer, and in consequence must be able to overtake its opponent. The tractor has the advantage in speed, but this is accompanied by the limitation of the arc of fire, which does not obtain with the propeller machine, and, since the fighter will always be the pursuer, this disadvantage would appear, at first sight, to be a vital objection to the employment of the tractor aeroplane in this class of work. The point is, however, of minor importance at the moment. Aeroplanes are capable of travelling in three dimensions, and the higher speed of the tractor machine will permit it to fly round, above or below its opponent, and to manoeuvre for such a position, that it is best able to deliver an attack with the minimum of risk. Many examples could be quoted, in the present war, where superior speed and climbing power have carried the day; but the time will come when the propeller aeroplane will possess the advantage in these directions, and then we shall have an ideal fighting machine. Indeed it is hardly too much to say that the fighting aeroplane must be either a propeller machine or a twin tractor, as that machine will be the most successful which can attack from the front.

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THE MOISANT TWO-SEATER MONOPLANE.—An interesting American machine, the general design of which, as regards the fuselage and planes, is similar to the Morane, while the under-carriage is of the Bleriot type, a combination which should prove extremely useful.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

IN the course of his speech in the House of Lords last week on the progress of the war, Lord Kitchener, Minister for War, said:—

"The much talked of advanced of the Turkish forces against Egypt has up to the present failed to materialise. Certain bodies of Turkish troops under German officers have been observed by our aircraft to be attempting to penetrate the country east of the Suez Canal, but no large force has yet appeared, and there has been scarcely any contact with our troops guarding the Canal."

In the dispatch dated January 8th, from "Eyewitness" present with the British General Headquarters, issued through the Press Bureau on the 10th there was the following:—

"According to the reports of aviators, whole districts in Southern Belgium are now flooded, for the Scheldt, as well as the Lys, has overflowed its banks. . . .

"It is extremely hard to conceal the position of trenches from an aerial observer, and once their position is notified to the guns and the exact range is obtained, it is not long before whole lengths of trenches will be blown in, and entanglements, *trous-de-loup*, and every form of obstacle, however ingenious, swept away."

In the French *communiqué* issued at 3 p.m. on the 7th inst. there was the following:—

"Our batteries put to flight some German aeroplanes which were flying towards Dunkirk."

In the account by the French "Eyewitness" of operations from December 25th to January, issued in Paris on January 7th, there was the following:—

"In aerial warfare, our aviators, in spite of the atrocious weather, showed great activity. Several of them in the course of reconnaissances had their machines struck in the wings or in the hood. Two lieutenants were slightly wounded by bullets. In the right of the front very successful bombardments were carried out. Twenty bombs were dropped on the railway station at Metz on Christmas Day, and six on December 26th. This was our reply to the Zeppelin raid on Nancy. Since December 26th no Zeppelin has been seen, while the railway stations of Château Salions, Remilly, Arnaville, Thiaucourt, and Heuvecourt have been bombarded on several occasions, as have also been concentrations of troops and bivouacs, both by day and night."

"On Christmas Day twelve bombs were dropped on a company at Gercourt, four on a bivouac at Dondrien, and 2,000 darts on wagons and infantry at Nampoeil. On the 26th ten bombs and 3,000 darts were dropped. On the 27th eight bombs were launched against a captive balloon on the heights of the Meuse, and on the 29th 2,000 darts were showered on a detachment at Dondrien. On the 31st 1,000 darts were dropped on troops at Saint Hilaire. A German aeroplane flying towards Paris was stopped and driven off. The night of December 25th

was very clear, and notwithstanding the high wind aviators went up at seven o'clock in the evening and passed the enemy's lines at a height of 16,000 metres. They observed a well-lighted camp, and dropped bombs, the effect of which they were able to see. With the first bomb all lights were extinguished.

"On their return journey the aviators were followed by searchlights, and star shells were also thrown up. They kept at a great height and escaped."

"Two of our aviators have fallen into the hands of the enemy owing to the breakdown of their engines. We got news of them in a letter which a German aviator dropped at Dunkirk. The following are the most interesting passages in the letter: 'We met with a bad accident yesterday, but we are still alive. Our motor was working splendidly when we passed over the lines at Ypres. Then we were subjected to a violent cannonade between Menin and Courtrai. At a height of 2,400 metres the motor began to misfire. We tried to get back, but still the engine would not work. We could see Ypres, but our machine continued to fall, and with rage in our hearts we were obliged to land. During our descent the guns continued to fire, and the aeroplane was tossed about by the air waves caused by the bursting of the shells. The infantry also fired on us, but we got safely to the ground. We immediately tried to burn our machine, but we could not do so, because the German soldiers approached, threatening to fire at us, and the petrol refused to light. Finally my comrade fired a shot with his rifle into the reservoir. Then there was a regular hail of bullets. I succeeded in lighting the petrol with my last match. I do not know how we escaped, because we were fired at at point-blank range.'

The following official message was issued verbally from the French Press Bureau on Monday:—

"The German aviators who flew over Dunkirk threw a number of bombs and caused five victims among the civil population."

"At Malo-les-Bains, near Amiens, a German aviator was chased by a French airman on a monoplane and brought down, the German machine falling in our lines. The pilot officer was killed and his companion wounded."

In a semi-official account, issued in Paris on Tuesday, of the French President's visit to Dunkirk, &c., on Monday morning, there was the following:—

"From Dunkirk the President motored to —, where he presented colours to French marines. In spite of the hardships which they had been through, the men were in a remarkably fine condition, both moral and physical. The ceremony, which was favoured by good weather, was extremely impressive. French aeroplanes kept up a continuous flight above the troops to prevent the possibility of any surprise marring the proceedings."

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THE ROYAL FLYING CORPS AID COMMITTEE.

LAST week a short statement of the work being done by the Royal Flying Corps Aid Fund was published, and our readers will be interested to learn that it has been continued on the same lines during the past week. Very many letters of warm thanks have been received from both officers and men of the R.F.C. for the gifts and comforts which the Committee of the Fund have been enabled to send by the kindness of the numerous subscribers. It is hoped at a later date to publish a few

of these letters so that those who contributed so generously may judge for themselves how greatly the gifts have been appreciated.

It may also be of interest to the donors to know that in addition to letters from the men themselves, many expressions of thanks have been received from their wives and families, whose anxiety for the comfort of the men has been relieved by the knowledge that their wants are being so fully provided for.

HYDROMECHANIC EXPERIMENTS WITH FLYING BOAT HULLS.*

By H. C. RICHARDSON, Naval Constructor, U.S. Navy, Chairman of Sub-Committee on Hydromechanics in Relation to Aeronautics.

DURING the latter half of 1913 the following work of interest was carried on at the Model Basin at the Washington Navy Yard.

This work comprised an investigation of the forms of hulls of flying boats (See Figs. 1, 2 and 3) in order to determine (1) their resistance at "displacements corresponding to speeds," on the water, and (2) their resistances "submerged," as a means of approximating

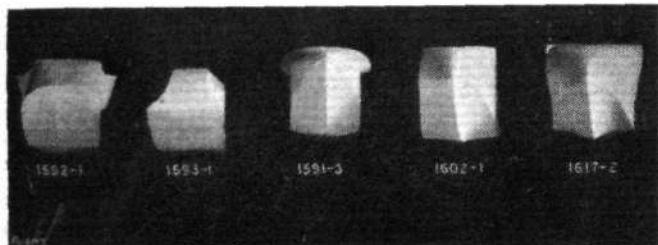


Fig. 1.—Bow end of models.

their total head resistances in air and of determining an approximate "coefficient of fineness of form."

As a result a form of hull has been derived which appears to have decided advantages over those already in use in the Navy, so far as resistance on the surface and in the air is concerned. Such a hull slightly modified to overcome structural difficulties is now being tried on a new navy machine.

Fig. 4 is a diagram showing the results obtained on model runs for the following models: 1591-3, 1592-1, 1592-5, 1593-1, 1602-1 and 1617-1.

At the foot of the sheet are diagrams of net resistance, and of derived e.h.p. for the full size, computed on the assumption that the total resistance of the full-size model at the corresponding speed is proportional to the displacement. As the models were all one-ninth full size the corresponding speeds for the full size are $\sqrt{9}=3$ times those for the models, and the resistances $9^3=729$ times those of the models. This assumption is interesting as a means of comparison; but the

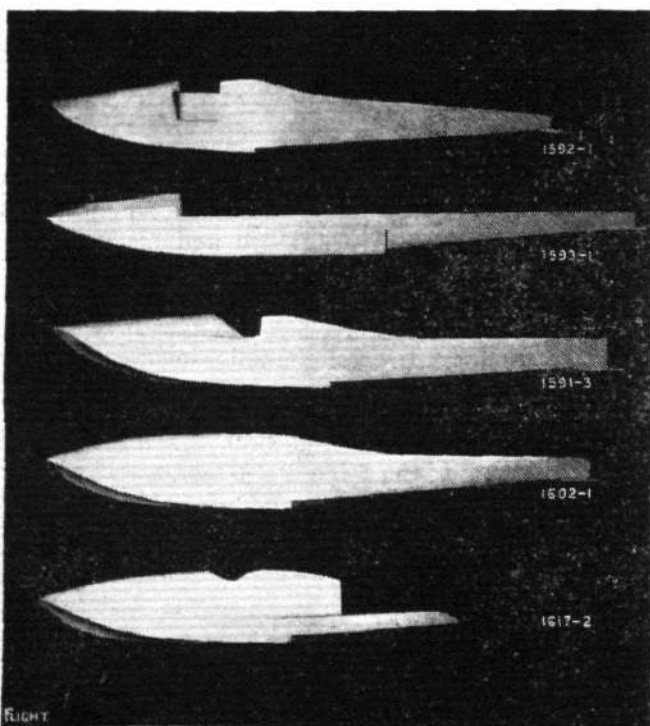


Fig. 2.—Side view of models.

e.h.p.'s so determined are inaccurate and exceed the true values, because the frictional resistance, which is an important component, varies with the speed to some power less than the square, approximately the 1.85 power. It is probable that the maximum error is less than 40 per cent. and the minimum as high as 20 per cent. in excess of the actual e.h.p., but the discrepancies are not considered

* From the Smithsonian Miscellaneous Collections, Vol. 62, No. 2.

to invalidate their value for comparative purposes. At the top of the plate the change of level curves are plotted.

The resistance curves were determined by towing the models at "displacements corresponding to speeds," with the models at a set "trim" but free to rise and fall under the influence of "suction" or "planing," and the change of level curves show how much the planing effect changes the draft at each condition.

All models were towed under conditions representing a full load of 2,200 lbs. and the assumption that the get-away occurs at 45 m.p.h. All were of the ventilated step type. An inspection of the resistance and trim curves will show the following general features:

- a. At low speeds, suction is present.
- b. This is succeeded by a condition in which the models run hard.
- c. Which is succeeded by a condition at which the model begins to plane.

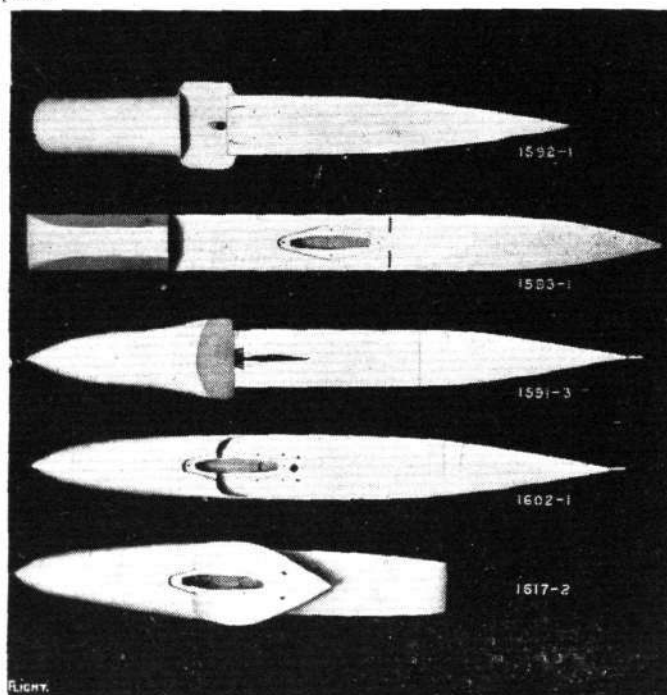


Fig. 3.—View of models from above.

d. And just before the planing is established the slope of the curve lessens rapidly.

e. And when planing is established the resistance falls off sharply with one exception.

f. Just preceding the "get-away" there is a tendency for the resistance to remain at an appreciable value, which

g. Falls to nothing sharply at the last.

Model 1591-3 was designed to obviate the defects of the flat scow bow type, and introduces the V bottom for the purpose of parting rather than pushing the water aside. The ventilated step was located so as to be slightly to the rear of the centre of gravity. This model 1591-3 was derived from 1591-1, which was a true V type. 1591-1 ran very well except for a remarkable sheet of spray at a speed corresponding to 12 m.p.h. This sheet of spray is shown in Fig. 5. Due to this spray it was considered necessary to modify the model, and this was done by making the V sections "full," the principal effect of the change was to augment the sheet of spray, so the opposite tack was next taken, that of making the V sections hollow in wake of the position from which the sheet of spray originated, and 1591-3 was thus derived. The result was that the spray was held down, the planing effect increased and the resistance reduced, an all round improvement.

Model 1592-1 was made from the lines of the Navy Flying Boat C-1.

Model 1593-1 was made from the lines of the Navy Flying Boat D-1.

Model number 1602-1 was derived from 1591-3, but the beam was increased from 30 ins. to 34 ins., otherwise the bottom was the same, at the same time an attempt was made to improve the form by

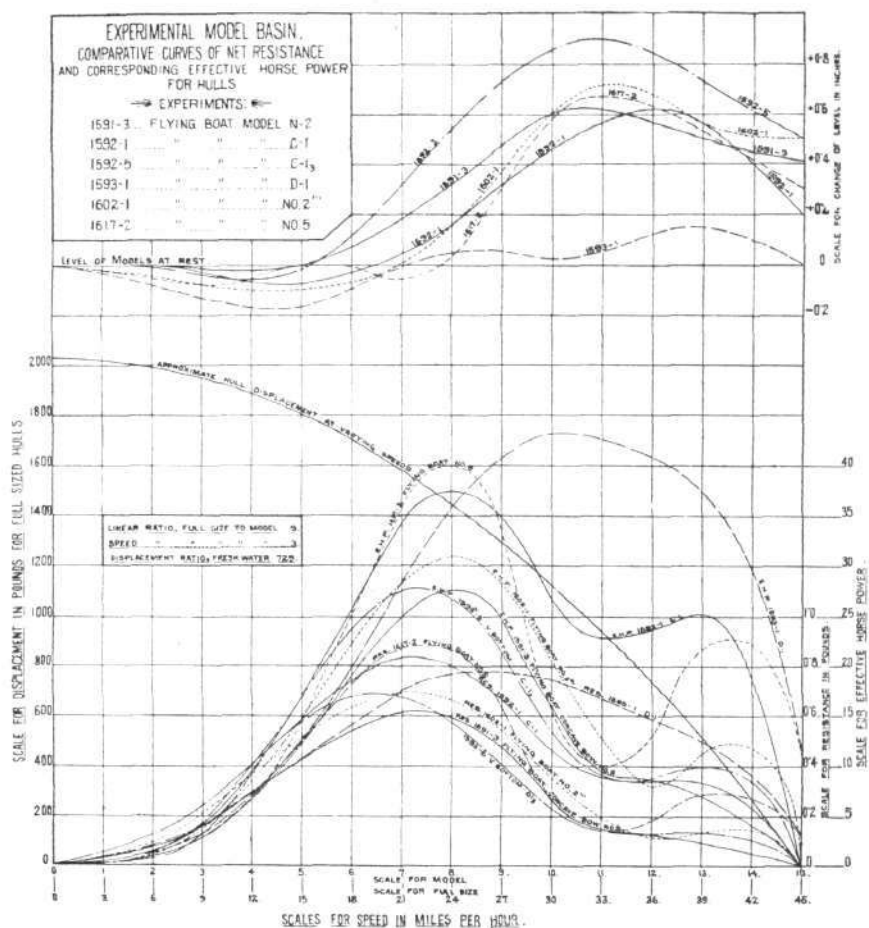


Fig. 4.

changing the form of the front hood, and by sloping the upper deck abaft the position of the planes. The results of these changes are apparent in the submerged runs.

Model 1592-5 was derived from 1592-1 by adding a shallow V bottom just forward of the step of 1592-1.

Model 1617-1 was designed on the general lines of the E-1, combination type (Owl type). The object of this experiment was principally to determine whether the shorter form was disadvantageous from an air resistance point of view.

An inspection of the performance of 1591-3, shows that from a resistance point of view it excels all but 1592-5, and an inspection of the change of level curves will show this to be intimately associated with the valuable "planing" qualities of 1591-3.

1592-1 behaves very similarly, but the resistance is higher, while 1592-5 behaves very similarly, but the resistance is lower than either of the two preceding and the change of level curves clearly demonstrate that the improvement is due principally to the improved "planing" effect, and it is also due to the better flow induced by parting rather than pushing the water aside, due to the V-shape at the step.

1602-1 behaves much the same, but the broader beam appears to increase the resistance slightly except where the planing effect reaches its maximum.

1593-1 behaves well at low speeds, but the resistance grows to a maximum at a much higher speed than any of the other models and falls off steadily but much less sharply than any of the others. The hump for the resistance curves occurs at about 27 m.p.h. for this model; at about 21 m.p.h. for 1591-3, 1592-1 and 1602-1, and at 19.5 m.p.h. for 1592-5. The sustained hard running of this model is clearly due to its failure to "plane," as is evidenced by the change of level curve.

New American Records Passed.

THE Aero Club of America has homologated the height record (aviator alone) of Capt. K. Le Roy Muller made on October 8th, 1914, on a Curtiss type tractor biplane (90 h.p. Curtiss motor), as 16,794 ft. The previous record was De Lloyd Thompson, 15,256 ft.

They have also accepted the flight of W. C. Robinson from Des Moines, Iowa, to Kentland, Indiana, on a parasol type monoplane with radial engine, both built by the pilot, as a cross-country

1617-2 has high resistance at speeds corresponding to 24 m.p.h., but in general behaves similarly to the other central step models.

Comparison of the model results with the actual performance of full-sized machines, shows a fair analogy exists, confirming satisfactorily the behaviour of the models. Certain experiments indicate that up to about 15 or 20 m.p.h. the aeroplane controls have very little influence on the change of trim of the full-size machines, and thus practically require the full-size machines to follow the trim imposed by the flow of the water about the hulls, and the models were set to closely approximate the "natural trim." Once planing is attained, or, the same thing, once "suction" is broken, the controls become effective and may be used to modify the trim. In the case of D-1, however, this condition is not reached till about 39 m.p.h. These experiments have also shown that the "planing" effect is very sensible to improvement if the angle of the bottom is increased, and as this can be brought about once planing is attained this shows a further advantage for those models which plane early.

The conclusions drawn from these and previous experiments are as follow:

a. The step should be close to the position of the centre of gravity, to eliminate a nosing tendency, to facilitate change of trim while planing, to avoid change of balance when getting away or landing.

b. Hollow V sections keep the spray down, cut the water more easily and cleanly, plane better, and greatly reduce shock on landing or when ploughing through broken water, and practically eliminate the necessity of shock absorbers.

c. A shallow step is sufficient, but ventilation is essential to facilitate the breaking of suction effects.

d. The bottom forward of the step should be inclined to the axis of the machine, but

e. The inclination must not be so great as to cause planing before the controls are effective, and this is particularly necessary when running before the wind.

If the planing of the hull is too pronounced, the machine rises to the surface with but very little control available to maintain balance, and when running before the wind this is more apt to

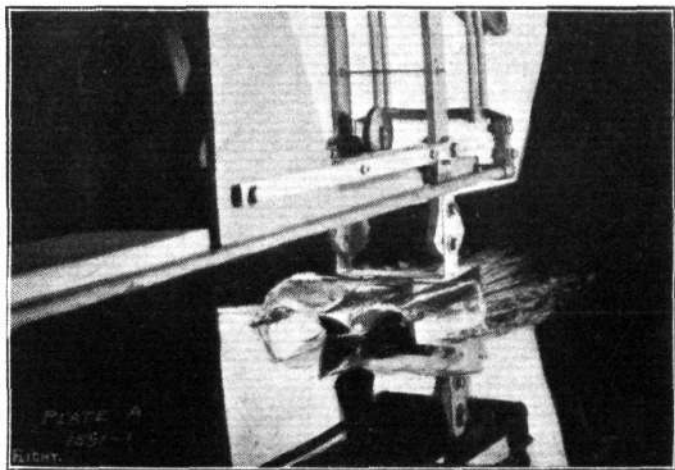


Fig. 5.—Sheet of spray made by model at a speed of 12 m.p.h.

occur due to the higher water speed necessary before the machine can take the air.

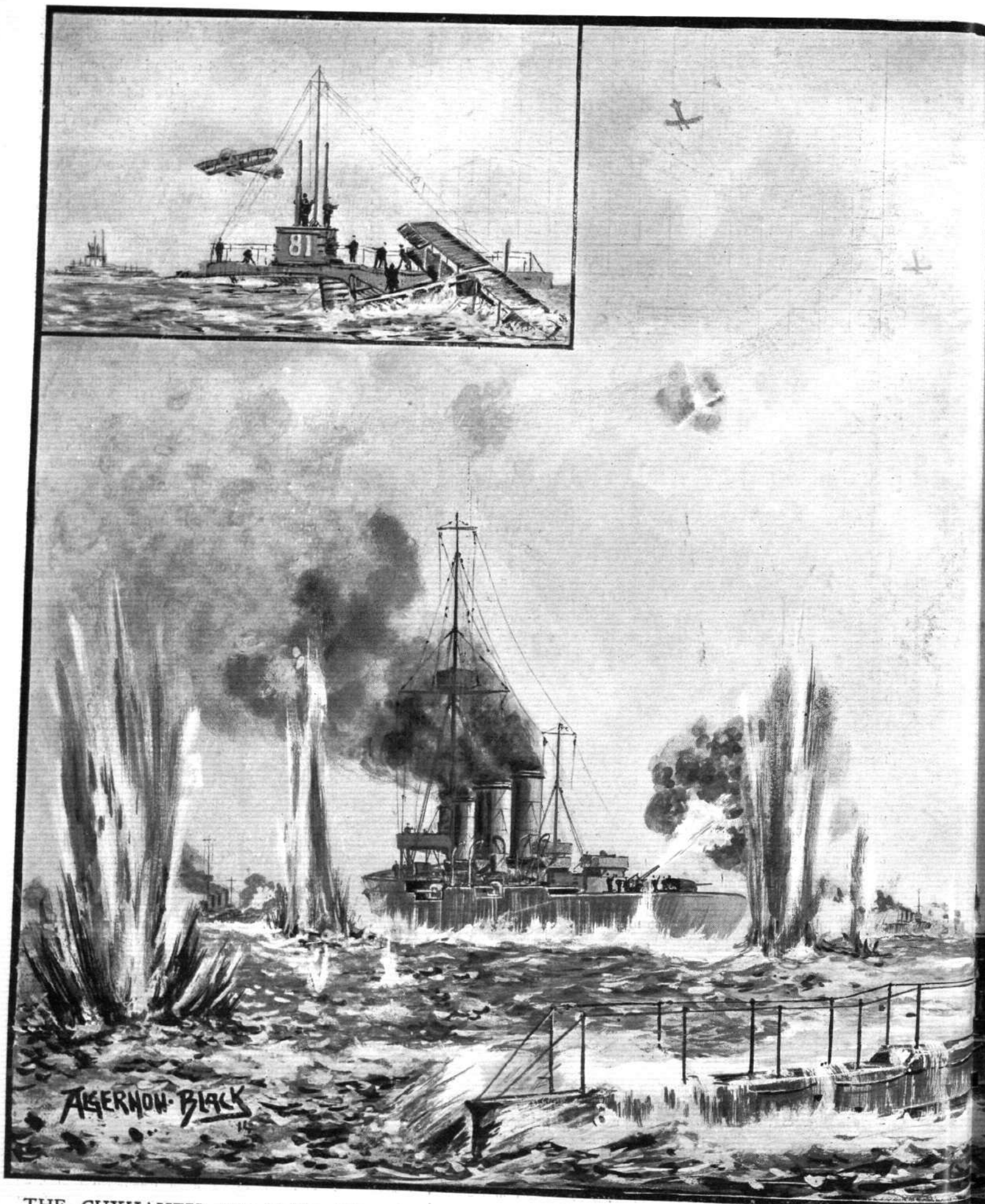
f. The bottom abaft the step should rise strongly, as this favours a steepening of the planing bow before suction is eliminated, and gets the tail well clear when planing begins.

(To be concluded.)

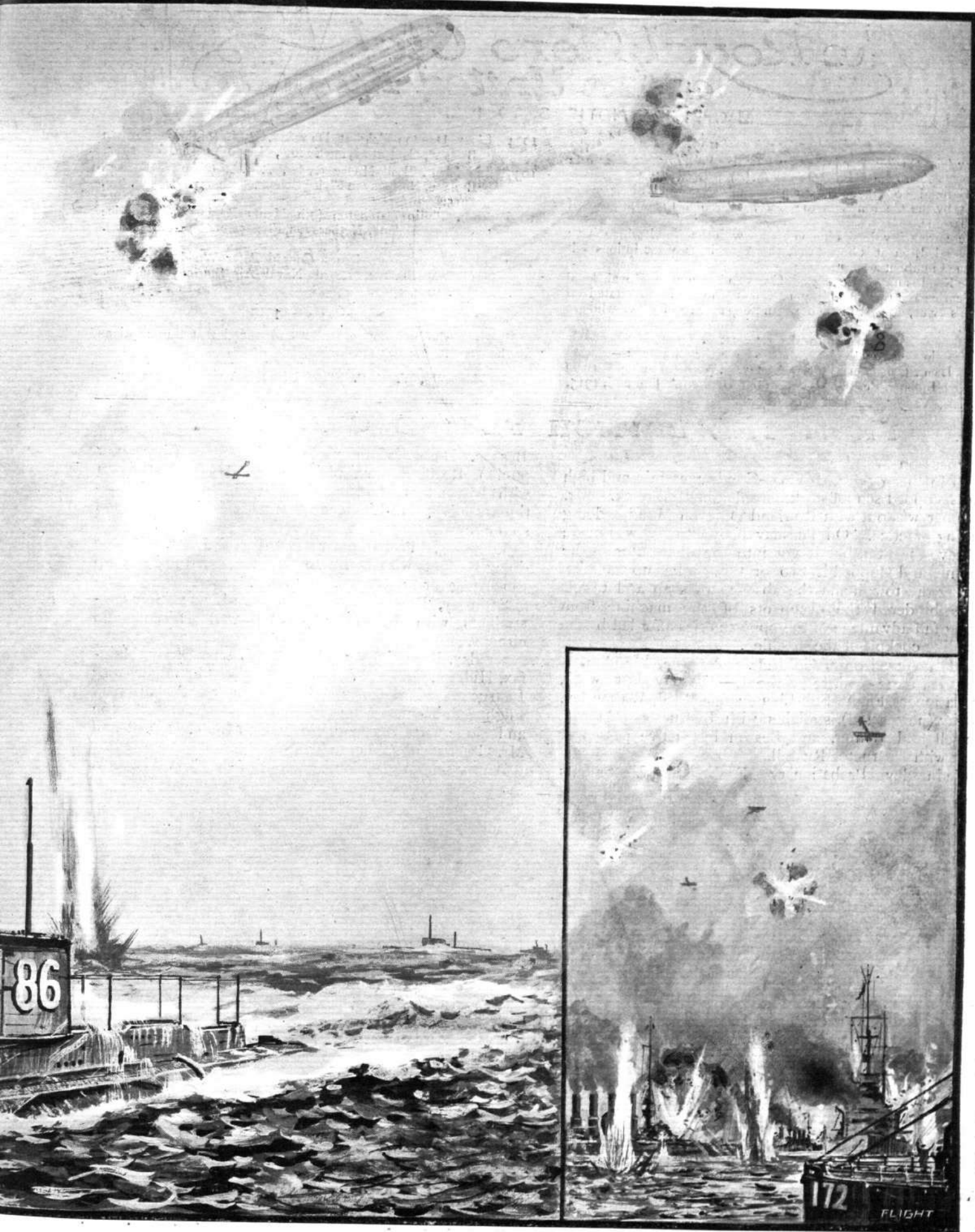
distance record (aviator alone), the figure being 332 miles and the time 4 hrs. 40 mins. The previous record was C. Mervin Wood, 217½ miles.

Pilots in America.

DURING the past year the Aero Club of America issued 42 aviator, 13 expert-aviator, 9 hydro-aeroplane, and 4 spherical balloon pilots' certificates, and the total numbers issued by the Club up to the end of the year were, aviator 282, expert-aviator 25, hydro-aeroplane 22, spherical balloon 49, dirigible balloon 3.



THE CUXHAVEN AIR RAID BY OFFICERS OF THE ROYAL NAVAL AIR SERVICE.—The beating off the enemy's seaplanes, Zeppelins and submarines. The inset on the right shows bombs being dropped on picking up the pilots before sinking the seaplanes.



picture shows His Majesty's ships "Undaunted" and "Arethusa," with submarines and destroyer division, German warships and works at Cuxhaven, and in the inset top picture the British submarines, after the raid, are the original drawing by Algernon Black.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

The Flying Services Fund.

(A fund for the benefit of those incapacitated during the War and for the widows and dependents of those killed.)

A General Appeal for Subscriptions to this Fund will be made shortly by the Chairman of the Club, Brig.-Gen. the Marquess of Tullibardine.

There are a few details in connection with the Fund which have to be settled, but it is hoped that the Appeal for Subscriptions will be issued in about a week.

The Fund is for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependents of those who are killed.

Aviators' Certificates.

The following Aviators' Certificates have been granted:—

- 1033 Lieut. Chisholm Wilfred Anstey, S.W.B. (Maurice Farman Biplane, Central Flying School, Upavon). Jan. 2nd, 1915.

- 1034 Lieut. Dawson Calybut Downing, R.N. (Maurice Farman Biplane, Central Flying School, Upavon). Jan. 6th, 1915.
1035 2nd Lieut. Basil Henry Ryder, R.F.A. (Maurice Farman Biplane, Netheravon Flying School, Netheravon). Jan. 6th, 1915.
1036 Capt. Philip Babington (9th Hants Regiment) (Maurice Farman Biplane, Netheravon Flying School, Netheravon). Jan. 7th, 1915.
1037 Flight Sub-Lieut. James Conrad Peter Wood, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Hendon). Jan. 10th, 1915.

Subscriptions, 1915.

Members who have not yet paid are reminded that Subscriptions for the current year became due on January 1st.

166, Piccadilly, W. B. STEVENSON, Assistant Secretary.

FROM THE BRITISH FLYING GROUNDS.

Bowness-on-Windermere.

Northern Aircraft Co.—Continuous rain and high winds stopped school work considerably last week. Mr. Lashmar was out with Rowland Ding on Monday doing landing practice. On Tuesday a gallant effort was made to brave the rain, but it got into the distributor of the Gnome, and stopped it two or three miles up the lake. During the tow home the absence of soap and towels alone hindered the occupants of the machine from taking full advantage of the opportunities afforded by the bath-like cockpit of the machine.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Tuesday last week, Probationary Flight Sub-Lieutenants Reed, Walmsley, Souray (new pupil), straights with Instructors Manton, Russell and Winter, and Besson instructive passenger flight with Instructor Russell.

Wednesday Probationary Flight Sub-Lieutenants

Besson, Digby, Hallifax, Hilliard, Petters (three new pupils), Reed, Souray, Walmsley and Wood straights with Instructors Manton, Winter, and Russell. Probationary Flight Sub-Lieutenants Mills and Mr. Greenwood solo circuits.

Thursday, Probationary Flight Sub-Lieut. Besson doing straights with Instructor Manton, but wind got up too strong for further flying practice.

Saturday, Probationary Flight Sub-Lieuts. Souray—straights with Instructor Russell—and Driscoll solo circuits.

Sunday, Probationary Flight Sub-Lieuts. Digby, Hallifax, Hilliard, Petters, Walmsley, and Wood straights with Instructors Manton, Russell and Winter. Probationary Flight Sub-Lieut. Besson straights with Instructor Manton and alone. Probationary Flight Sub-Lieut. Driscoll and Mr. Greenwood solo circuits.

A new school machine came out of the shop this week,



Copyright F. N. Birkett, from the "F.N.B." Series of Aviators.

Probationary Flight Sub-Lt. R. M. Field. Probationary Flight Sub-Lt. J. O. Groves. Probationary Flight Sub-Lt. G. W. Price.
A trio of officers who have recently taken their pilot's certificates at the Grahame-White School, Hendon.

increasing the fleet to four; another is in hand, and will be ready very shortly.

It may be interesting to note that since the beginning of September the school has turned out 32 certified pilots, 24 being officers of the R.N.A.S., and during the week ending December 21st, eight pupils obtained their certificates, a pretty good record for one school.

Beatty School.—Last week pupils out training on "dual"-controlled two-seater machines, instructors being Messrs. Geo. W. Beatty, E. Baumann, W. Roche-Kelly and G. Virgilio.

The following pupils received tuition during the week:—Messrs. Gordon Bond, Anstey Chave, P. E. Cornish, G. Merton, G. Beard, G. Donald, M. J. V. Miller, Gerrit Forbes, H. H. Bright, R. Laver, S. Caws, and Lieut. Bannatyne, machines in use being 40 h.p. Wright-engined biplane, a 50 h.p. Gnome-engined biplane, 60-70 h.p. Wright-engined biplane.

Hall School.—Instructors for last week, J. L. Hall and J. Rose. Good straights by Davy Waterson and Minôt (new pupil). At the end of the week Mr. W. J. McConnochie did 6 excellent straight flights at 10 ft. Mr. J. Lloyd Williams, who has also shown great promise, is now doing good circuits and eights on No. 3 Tractor, and will shortly go for his *brevet*.

London and Provincial Aviation Co.—Monday, Mr. Collett rolling. Tuesday, Collett rolling, Abel straights. Wednesday, Abel and Laidler straights; Moore, Derwin, and Collett rolling. Thursday and



Mr. Robert W. A. Invermee who secured his *brevet* at the Caudron School, Hendon, towards the end of last year.

Friday, wet and windy. Saturday, Collett rolling. Instructors during week, Messrs. Warren and Smiles.

Ruffy School.—During last week Instructors, Messrs. Herbert James and Howard James. Pupils being instructed on 60 h.p. dual control machine, Messrs. Grahame, Donald, Marriott; Messrs. Aoyang and Kenworthy started tuition on 45 h.p. single-seater.



CORRESPONDENCE.

Utilising Enemy Patents.

[1895] Might I be permitted to refer in your columns to the emergency patent laws, offering the right to manufacture under enemy patents, the facilities afforded by which are, I fully believe, more far-reaching than is realised by a large section of the manufacturing community. The right to manufacture is, of course, granted in the form of a personal licence in favour of the manufacturer applying to the Board of Trade, and, as you are doubtless aware, it is now clear from statements made by the Commissioners for the Board of Trade at Hearings of these cases that except in perhaps the case of trivial manufactures not involving extensive outlay, the licensee will not be deprived of his right to manufacture upon the expiration of hostilities. If after hostilities the British licensee cannot come to reasonable terms with the foreign proprietor, the matter will be settled by arbitration conducted by the Board of Trade. If, however, advantage is not now taken of the law, the enemy patents will, in their entirety, be restored to the enemy proprietors after the termination of war.

There are undoubtedly a large number of valuable patents under which British firms would, in times of peace, one would believe, welcome an opportunity of obtaining a licence, which licence the foreign proprietor would be unwilling to grant, and the introduction of this emergency law thus offers an opportunity of obtaining an asset which might never have been obtainable had not the war occurred. It is important to realise that the substantial advantage arising out of this asset might arise after hostilities, and at a time at which a number of manufacturers, having lost the opportunity of taking advantage of the law, may probably regret having done so.

Another aspect is that while the right is granted in the form of a personal licence, decisions of the Board of Trade tend to encourage applications for subsequent licences under the same patent. One British firm might, for instance, obtain a Board of Trade licence under a German patent. During the existence of the emergency law, other firms could doubtless obtain licences under the same patent. If they do not take the opportunity but allow the law to expire, then they will irretrievably have lost the chance of obtaining licences, while the first firm still retains, and continues to enjoy, its licence. The other firms, in such a case, would, after hostilities, obviously be placed at a considerable disadvantage.

LEWIS WM. GOOLD, F.C.I.P.A.

5, Corporation Street, Birmingham.
January 9th.



ENEMY PATENTS RELATING TO AERONAUTICS.

THE following list of British patents which have been granted in favour of residents of Germany, Austria, or Hungary, is furnished in view of the new Patents Acts, which empower the Board of Trade to grant licences under certain conditions to British subjects to manufacture under enemy patents, and is specially compiled for FLIGHT, by Lewis Wm. Goold, Chartered Patent Agent, Enrolled Patent Attorney in the United States, 5, Corporation Street, Birmingham. It is desirable in the first instance to obtain a full copy of the patent specification (price 6d. each patent), and also the latest particulars upon the Patents Register. If any patent listed has been assigned to a non-enemy proprietor, the law does not apply.

No. 29108/11. Aerial machines without aerostats; propelling.

In a flapping-wing machine, each wing arm is disposed near the forward edge of the wing, and is oscillated about a ball joint by a crank and connecting rod, the arm being constrained by a guide so that in the up-stroke the rear edge is below the forward edge of the wing, while in the down-stroke the reverse is the case. Muhter, M., Prussia.

No. 265/12. Shock of landing, deadening. The land wheel axle of an aerial machine is carried by spring-controlled supports, which, in addition to their vertical sliding movement, are capable also of inclining in any direction about their upper ends. Dorhofer, P., Germany. Dated June 20th, 1911.

No. 1396/12. Propelling. End thrust bearings for the vertical or inclined shafts of propellers for flying machines, comprise a pair of ball-bearings arranged between beams secured to the machine, and collars formed on the shaft. Mees, G., Germany. Dated April 3rd, 1911.

No. 2345/12. Aerial machines without aerostats; planes, arrangement of; steering and balancing. The radially-arranged supporting planes of a flying machine are freely rotatable on a fixed shaft carrying the car and motor, and the outer sets of planes, consisting of radially-arranged planes connected at their extremities by peripheral planes, are mounted on the said fixed shaft. Trossin, O., and Michaelis, A., Germany. Dated June 30th, 1911.



Rewards for Lieut. Hewlett's Rescuers.

It was announced from Rotterdam on Wednesday that the British Vice-Consul at Ymuiden had on behalf of the British Government, presented £100 to the crew of the trawler "Maria van Hattun" in recognition of their having saved Flight-Commander Hewlett after the aircraft raid on Cuxhaven.

“PROPELLER FLUTTER.”

ALTHOUGH the efficiency of modern airscrews has reached a very high figure—as a result of the care and skill which have been exercised in their design and manufacture, and in the selection of suitable grades of material—there is but little doubt that a still better performance could be obtained were it possible to either entirely or partly eliminate what is colloquially termed “propeller flutter.” This phenomenon may be seen on viewing an airscrew in motion from the side—the blade appears to, and does actually, vibrate in a plane containing the axis of the shaft to which it is fitted, and is effective in reducing the efficiency because the aerofoils forming the blades do not attack the air at a constant angle. There are several factors, in any power plant installed upon an aeroplane, that contribute to this.

Firstly, no engine is entirely free from unbalanced forces and couples, although some will run very smoothly under load; hence, when it is mounted upon such an elastic framework as that of an aeroplane, the integral parts of the whole structure will be caused to vibrate. The longer and the more flexible the member is, the greater will be the magnitude of its vibration; which is also increased if the damping forces are small, or if the impulses causing vibration synchronise with the actual period or multiples of the natural period of vibration. There is a tendency, therefore, for the airscrew, which is rigidly attached to the crankshaft of the engine, to vibrate in a plane approximately at right angles to the direction of its motion through the air, during rotation.

A second cause of “propeller flutter” is due to the medium in which the airscrew works. Air is not a homogeneous substance, it varies in density according to the elevation and its location; but this would be of no importance whatever as regards the matter we are now discussing, provided that any change in the direction and the velocity of its motion were effected gradually. In practice, however, both the direction and velocity of the wind relative to the airscrew may vary over wide limits; and since the normal mode of motion of any body is one of uniform velocity, the airscrew encounters a varying resistance and exerts a varying thrust. Now, when a blade is transmitting power, it is deformed slightly by the pressures acting upon the two surfaces—a variation in these pressures due to the cause we have just mentioned must permit the blade to resume its former shape or to be still more deflected, and if the gusts or other disturbing forces occur with some regularity, it necessarily follows that a blade will be caused to vibrate (again) in a plane approximately at right angles to its direction of motion.

A similar effect will also be produced should the airscrew be placed in close proximity to fixed parts of the structure of the aeroplane, as the flow of air over the surfaces of the blades will be subject to periodic interruption as the blades or parts thereof pass by them; while the effect of a side wind upon the pressures acting upon the blade, although too complicated to examine in detail here, must also partake of a similar character.

Propeller flutter is also caused by lack of uniformity of torque. Assuming that resistance to the rotation of the airscrew is approximately constant at any instant—and any fluctuation in resistance will only tend to complicate matters and render the speed of rotation more irregular—the ideal motor would be one that would produce a continuous and uniform torque. Any excess or deficiency in the energy delivered to the propeller, above or below the average required for propulsion, must

tend to accelerate or decelerate the moving parts. The inertia of these parts—pistons, connecting rods, crankshaft, flywheel and airscrew of fixed engines, and the cylinders and crankcase also, but not the crankshaft, in rotary engines—resists the change of velocity and tends to keep the angular speed of the airscrew constant, but is only capable of so doing within certain limits and the speed must, therefore, vary to some extent. Hence, as the velocity of the blades is increased or decreased, there is a variation in the thrust delivered by the blade; and, consequently, the same action as was indicated above as due to variation in the air velocity—the deformation or the partial straightening of the blade—must also here become evident: with this difference, however, that the pressure variation must in this case occur continually and have a high frequency.

Lastly, structural deformation is sometimes responsible for the presence of this phenomenon, and it is more particularly in evidence when the airscrew is direct coupled to the crankshaft, without the interposition of an intermediate shaft, of an engine in which the crankshaft is under, rather than over, the usual standard of rigidity; or in which the end bearing is abnormally short. Under the explosion pressure in the cylinder, the crankshaft is bent to a slight extent and tends to tilt the end of the shaft outside the crankcase. This action is resisted in part by the bearings, but if these are short, or if the end-plate of the crankchamber is not sufficiently stiff, the major part of the movement takes place, and being transmitted to the propeller, the blade tips move towards the front or to the rear, according to the position in which they happen to lie at the moment of explosion. Hence, again, there is the same ultimate effect produced as that due to variations in the air velocity, in fact, the real origin of the vibration of the blade is the variation in the *relative* speed of the air over the blade. It will be clear that where the airscrews are driven by chains or by some other form of gearing, this particular action does not take place, and this may partly account for the excellent results obtained with the very crude propellers so driven on some of the earlier machines.

Both of the last two effects to which attention has been drawn are, it will be observed, due to periodic forces; and these, if applied with sufficient frequency and at certain definite intervals of time, may be productive of marked results upon efficiency—altogether out of proportion to that which might have been anticipated from the small forces to which they are due. Their elimination is, therefore, especially desirable, and by use of (1) a large number of cylinders, (2) a flywheel, or its equivalent, of large capacity, and (3) an exceptionally rigid crankshaft and end bearing, much can be done in this direction, while the employment of a short intermediate shaft and affording a substantial support to the crankcase, should assist in diminishing “flutter” due to crankshaft deflection.

The effects of gusts and other wind changes of a similar character cannot be prevented from arising, but these are negligible, except that due to the influence of a side wind upon the airflow over the airscrew, in comparison with the other factors mentioned.



An 1870 Relic for Sale.

MRS. REY, a member of the Royal Aero Club, wishes to sell, on behalf of the owners, who are in straitened circumstances on account of the War, a letter and a copy of *Le Ballon Poste*, which were sent by balloon from Paris during its siege in 1870.

EDDIES.

A WELCOME visitor to Hendon last week was Flight Sergeant A. E. Barrs, returned from France, where, as a result of his accident a little while back, he has been in hospital for some considerable time. Aided by a couple of struts, fitted with T pieces at the top, otherwise known as crutches, he now manages to do a straight from his "digs," in Collindale Avenue to the aerodrome in quite fair time, and the landing chassis with which nature endowed him will, it is hoped, soon be in running trim again. The accident does not appear to have detracted from his liking for the higher strata of the air, for A. E. B. is contemplating a passenger trip to Farnborough as soon as an opportunity presents itself. During a chat at Hendon on Saturday last, Barrs related how he came to be temporarily *hors de combat*. He and another pilot, both on Blériots, were starting out for a reconnaissance. While waiting for his companion to get ready Barrs had his engine going several times, and when at last a start was made, the engine appeared to be pulling badly as soon as the machine rose from the ground, although it ran quite well before getting off. Thinking that the mixture might be at fault, he tried to adjust it, forcing the machine to climb all the while. Finding himself at a height of about 150 ft. heading towards a row of houses with the engine still refractory, he decided to turn before getting over the houses, but in the manoeuvre the machine overbanked and did a side-slip, leading to a nose dive to the ground. Another ten feet would have enabled Barrs to make a safe landing, but, as he himself says, they weren't there. The petrol became ignited, and on attempting to extricate himself from the wreck Barrs found that one of his legs refused to support him, and it was only with the greatest difficulty that he managed to pull himself up by hanging on to the pylon, and then, by rolling down one of the wings, to get out of reach of the flames.

He promptly received first aid, and an improvised splint was made by binding a rifle tightly to the injured leg. Owing to the fact that it was not realised that the leg was broken, the temporary bandage did not improve matters, but fortunately, as I have said, Barrs is now home and well on the way to recovery.

x x x

The enviable reputation established by the Aircraft Manufacturing Co. at Hendon for delivering machines in all sorts of weather, when M. Verrier was their pilot, is being worthily upheld by his successor, Mr. Birchenough, who takes the new Henrys and Maurices across to Farnborough with the regularity of a train service. That this entails some, at times, rather trying trips goes without saying, and it was therefore not considered anything out of the usual the other day—Friday of last week, to be exact—when the journey to Farnborough took Birchenough a matter of two hours and ten minutes. He was piloting one of the new Maurices accompanied by a passenger. Whilst Birchenough regards a trip of this sort as being all in the day's work, his passenger is said to have been extremely bored looking down into the same chimneys for several minutes at a stretch. On Saturday last a Henry Farman was to have been delivered, but, on making a preliminary flight to test the air, it was found that the wind was so strong that the machine could make no headway at the altitude at which it would have been safe to attempt the journey, so Birchenough had to reluctantly abandon the trip and be content with giving some demonstrations of his excellent handling of his mount. In spite of the high wind blowing, he put the

machine through a number of steeply-banked turns, which recalled to mind the evolutions of Messrs. Chevillard and Verrier, in the "piping times of peace."

x x x

When glancing in some of the sheds up at Hendon one or two old acquaintances which have, since the beginning of the war, been stationed elsewhere were easily recognised. Among the latest arrivals are the Pemberton-Billing Scout, otherwise known as the seven-day 'bus, from the rapidity with which it was designed, built and flown; also the little 45 h.p. Anzani-engined Perry-Beadle biplane formerly quartered at Brooklands.

x x x

When the full story of this war comes to be told there is no doubt that the rôle played by aircraft will prove to have been of even greater importance than the most optimistic of us have ever anticipated. The excellent work done on aeroplanes in obtaining information regarding the movements of troops, &c., is by now universally recognised, as well as many other helpful purposes to which aeroplanes have been put. From pilots and others returning from the Front it is possible now and again to form some idea of the "inner" efficiency of our air services, although it is not politic to give details of some of the work. It is more and more evident, however, that the success which is now being achieved by the Allies' heavy artillery is to a very marked degree due to the invaluable service rendered by flying officers in directing gun fire. Some of the results have been marvellous, buildings being simply blown to pieces at the third shot, it being had in mind that the target is not so much as seen by the gunner.



Flight Sergeant A. E. Barrs, who is now recuperating at Hendon after his unfortunate accident while on active service in France.

Things aviatric seem to be on the move across the pond as indicated by a lively activity among the various aeroplane constructors. Probably some of the far-sighted ones are anticipating that the U.S. Government will, after seeing the work accomplished by aeroplanes in the present war, organise Flying Corps on a generous scale for both the Army and Navy. At any rate, new types of machines are being tested almost daily, and some of the older firms, finding themselves cramped in their original quarters, are seeking fresh fields and pastures new. Among other changes it transpires that Glenn H. Curtiss is removing his works from Hammondsport, N.Y., at the southern end of the beautiful Lake Keuka, where the Curtiss machines have hitherto been built, to Buffalo on the eastern shores of Lake Erie. The new works form a portion of the large premises formerly occupied by the Thomas Motor Car Company, and construction can here be carried out on a scale more in keeping with the demand for the various types of Curtiss land and sea going machines. Besides, Lake Erie affords much better facilities for testing than did Lake Keuka, and as the distance away is only comparatively short, we shall probably hear of some of the Curtiss pilots flying over Niagara Falls before long.

Talking of American aviation developments reminds me that I was told the other day that the ban on flying over cities has been raised by the Aero Club of America, and that aviators holding the "expert" certificate may now fly over cities if they wish. In order to qualify for the "expert" certificate, the aviator has to pass a physical examination by a physician designated by the Aero Club of America, and, in addition, the following tests of his ability as a pilot: A cross-country flight of 50 miles length, out and back, without alighting; a glide with the engine shut off from a height of 2,500 ft., coming to rest within 50 metres of a designated point without the use of brakes; a figure of eight around two marks 500 metres apart. In making the turns, the aviator must keep all parts of his machine within semicircles of 50 metres radius from each turning point as a centre.

No mention has been made, as far as I could learn, of the minimum height at which the pilot should fly when over towns, so probably the Aero Club of America trust that the pilot, if not for the sake of the safety of the public, at least for his own sake, will fly at a sufficient height to enable him to reach open country should his engine fail him.

"ÆOLUS."

AIRCRAFT AND THE WAR.

A CORRESPONDENT of the *Observer*, writing from Warsaw under date of December 27th, said:—

"To the eastward-going stream must now be added the enemy's aeroplanes, who, after a lull of a fortnight, during which we had only Zeppelins, have again come in numbers. The last German aeroplanes have dropped no bombs, but have circled over the city and sometimes flown off to the east at great heights. Their movements indicated that they have been watching the railway station here and at Praga, and counting troop trains. I watched an aeroplane which swooped down from a great height in the west. It dropped lower over Praga; was shot at by guns stationed I do not know where (shells could be seen exploding below it), and then, followed by two Russian monoplanes, sped at a terrific speed along the Vistula in the direction of Novogeorgievsk.

"Some of the reconnoitring 'planes fly far in the interior. Last week one fell at Bjela, which is 200 versts west of this city. Two very young men, a lieutenant and a soldier mechanic were on board. When the military guard came to remove them from the estate on which they had been captured, they found the lieutenant at a piano playing Mendelssohn—much as did the French prisoner of 1812 in Turgeneff's story.

"At Lodz, Lowitsch, Skiernewice (still in our hands) and here, about 200 persons, mostly civilians, have been killed by air bombs since the beginning of the new German advance. Lodz has suffered most. A member of the party of M. Guttkhoff (Inspector of the Red Cross, formerly Duma President) told me that in the Piotrkow-street, fourteen persons gathered in a crowd were killed by a single bomb. As I have personally convinced myself, townspeople and villagers show incredible incapacity to judge what is dangerous from what is not, and to take precautions. Whenever a bomb-bearing Zeppelin appears the Poles collect in crowds. When the enemy rushed Prushkow in October, trippers went to 'see' them. A shell which killed half-a-dozen ended the trip."

A correspondent in an account of the French advance on Orbey in Alsace on January 3rd, said:—

"Snow had begun to fall. None the less, one of our aeroplanes managed to reconnoitre the enemy's position, and brought back the news that there was a movement of troops on the south of Sainte-Marie, and that some of the Prussian advance posts were retiring towards Saint-Croix."

Mr. Perceval Gibbon, a *Daily Chronicle* correspondent, writing from Zyrardow in Poland on January 3rd, said:—

"The commander of the trench considered the German aeroplane service beyond praise. Despite my incredulity, he repeatedly affirmed that German aeroplanes are able to halt or hover in the air above one spot, slowly sinking the while, and then rising again and flying on. This manoeuvre serves admirably to guide the fire of their guns."

In an Exchange message from Petrograd on the 6th inst., it was stated:—

"Reliable reports say that Field-Marshal Hindenburg's advance plans have been badly hampered by the impossibility of moving his heavy artillery. Airmen scouts have seen a great block of heavy artillery, supposed to include a 42cm. mortar, at frontier railway stations, and outside the stations they have seen guns which have come to a standstill in the mud."

A *Daily Mail* correspondent in the North of France reported on the 8th inst.:—

"The enemy's aeroplanes have been very active during the last few days. The day before yesterday Abbeville was twice visited and several bombs were dropped, one falling in the cemetery, doing no damage. There was no loss of life. Three bombs were dropped on Hazebrouck. Armentière has also been visited, and received several bombs. Nobody was hurt at either place."

Writing from Copenhagen on Saturday, a *Daily Telegraph* correspondent said:—

"A German aeroplane, with two passengers, was observed at Esbjerg and its environs, flying only about forty metres above the ground. The passengers were waving their hands to the inhabitants. The aeroplane disappeared after an hour.

"On account of this visit the *Ribe Stiftstidende*, an old provincial paper of high standard, prints an article, saying, 'We hope the German military authorities will instruct their aviators not to fly over neutral territory, as the aeroplanes of belligerent Powers should have nothing to do in neutral countries, and we trust our Government will call the German Government's attention to the matter, pointing out that similar flying excursions will not take place in future without risk to the passengers and their machines. In neutral Switzerland they shoot at them without ceremony.'

According to the Sluis correspondent of the *Telegraaf*, the petrol tank of one of the Allies' aeroplanes which appeared off the coast of Flanders on Saturday was hit, and the machine descended at Zeebrugge, the occupants, a French aviator and a Belgian officer, being taken prisoners.

A *Daily Chronicle* correspondent, writing from the Franco-Belgian frontier on the 10th inst., said:—

"Calais had a visit last night from a Zeppelin and three Aviatik aeroplanes, which, flying high over the town, were reported to be heading in the direction of Dover. Anti-aircraft guns, mounted on motor cars, were hastily rushed to an advantageous position for an attack, but the German machines, without doing any damage, continued their journey at top speed. The Zeppelin had come from the interior of Belgium, passing over Furnes and Dunkirk."

"There has been exceptional activity on the part of the enemy's flying men of late; and on most days during the past week aeroplanes have been seen in the vicinity of Dunkirk and Calais, whilst bombs have been dropped over other towns during the last 48 hours. For instance, yesterday morning an aeroplane made its appearance over Hazebrouck, and discharged three bombs, but, happily, none of them burst. Two British aeroplanes gave chase, but the German escaped.

"The same morning from a Taube came three bombs aimed at the railway station at Armentieres. Anti-aircraft guns, mounted in readiness to meet any such raid, were soon in action, and the aeroplane hastily retreated before the shower of shrapnel.

"Then there was an exciting incident at Abbeville—an open town, by the way—an aeroplane releasing bombs which fell on ploughed land on the outskirts, without doing damage. The German aeroplane which aimed these futile shots went off following the Calais to Paris railway line.

"Yet another of these German raids is to be recorded, and this was at Doullens, where bombs fell into the river."

Another correspondent of the same paper reported the following from Deal:—

"Considerable vigilance and activity have been displayed off Deal and along this part of the coast to-day.

"At 10.30 this morning an aircraft, flying at a great height—from four to five thousand feet—made two wide-sweeping movements over the Downs, as if searching for something, and then rapidly steered in a south-westerly direction.

"At 12.45 p.m. another aircraft was seen, flying much higher than the first machine, so high, in fact, that although the weather was beautifully calm and still, the noise of her engines could not be heard. When over Deal she appeared to be but a speck in the clear sky, but was easily distinguished with the aid of glasses. For nearly 15 mins. the airman cruised in this neighbourhood, and after making a wide detour over the Downs took a zigzag course inland.

"At four o'clock another machine, also flying high, came over from the north-west, skirted the sea off Deal, and proceeded in a southerly direction."

Mr. C. E. Tripp, a *Daily Chronicle* correspondent at Amsterdam, reported on the same date:—

"There was activity on the part of the 'Allies' airmen over the Belgian coast yesterday morning. For an hour or two heavy firing was directed by the enemy at the aircraft."

It was reported from Paris on Monday that two German aeroplanes had attempted to fly over Paris on the previous day, one coming from the direction of Mont Didier and Pontise and the other from Dammartin. French aircraft, however, immediately ascended and put the hostile aviators to flight.

The following account of the aerial attack on Dunkirk last week end was sent by Mr. G. Ward Price to the *Daily Mail* on Monday:—

"The biggest air raid of the whole war was carried out by the Germans against Dunkirk yesterday. Fourteen armoured Aviatik biplanes formed the attacking force and cruised over the town from 11 a.m. to 3.30 p.m. The tocsin sounded first from the high tower of Dunkirk church at 11 a.m., and the blue and white flag of the town was run up on the staff. Then a solitary biplane appeared from the east. It was the scout in advance of the main body of the squadron. In spite of the warning bell people gathered in the main square of the town and the side streets to look at the gleaming aircraft overhead, for though this was the third considerable air-raid on Dunkirk they thought that this was only a solitary biplane. Only a few minutes passed, however, before the tocsin rang again, and this time five German aeroplanes swam into sight in the clear sky. One aeroplane came from the north, from the sea, the four others from the east. All five were together over the central square of Dunkirk at a height of only 3,000 ft. Meanwhile the guns of the forts were ranging on them with shrapnel, and all round the German fliers the white puffs were bursting. One of the biplanes turned back, and as the sun glinted on the steel sides the few people who had not taken shelter in their cellars raised a cheer, for they thought it was on fire. However, more and more of the airmen came, while the first went on to drop their bombs on Dunkirk's suburbs—Malo, Coudekerque, Rosendael, and St. Pol.

"In all 50 bombs were dropped, some explosive and some incendiary. In Malo five people were killed; in Dunkirk one.

"At St. Pol several people also were killed, but as no official statement has been issued it is impossible to give exact figures. It is even said that four were killed at Adinkerke, six miles away.

"Two of the raiders were brought down by gun-fire, one near the flying ground outside Dunkirk, and another on its way home, at Wulpen, which is twenty miles away towards the German lines, to the north of Furnes.

"The absence of a large number of French aeroplanes from Dunkirk yesterday was evidently known to the Germans, probably through spies, of whom several have been recently arrested in the town. One French machine went up against the host, but six of them immediately set themselves to surround it, and it had to come down.

Another *Daily Mail* correspondent reported on Monday:—

"The importance of the great German air-raid on Dunkirk on Sunday is the greater by reason of the fact that the raid was intended to harm the French President, who was expected at Dunkirk to present a flag to the famous French Marine Fusiliers.

"The President did not arrive until this morning, but that the German airmen were misinformed by their spies is evident from the fact that at the end of their day's bomb-dropping they threw down weighted streamers on to the town which bore the words 'Bon jour, Poincaré; à demain.'"

A *Times* correspondent in Northern France, writing on Monday, said:—

"It is believed in some quarters that the aeroplanes which threw bombs in Malo-les-Bains and Dunkirk are the same which were sighted in the Channel on Sunday morning and that, having failed to reach England, they vented their displeasure upon the French port.

"The raid calls attention once more to the fact that modern warfare, like that waged with bows and arrows, is to some extent at the mercy of the wind. On Sunday morning the wind was too strong to allow of a flight across the Channel. For the same reason the rumour that a Zeppelin approached Calais on Saturday night can scarcely be regarded seriously. Indeed, in well-informed circles here the idea of a Zeppelin raid on any considerable scale during the present boisterous weather is, to say the least of it, improbable."

Writing from the Belgian frontier on Monday to the *Daily Express*, Mr. Percival Phillips said:—

"Information reached me late this evening that yesterday's attempted raid on towns in the possession of the Allies by more than a dozen German aeroplanes, which was frustrated owing to the sudden storm and high wind, began at Ghistelles, a village to the south-east of Ostend, which is now an important base of the aerial wing of the enemy's forces in Flanders. Already fifteen hangars have been constructed there, with sheet iron roofs covered with sandbags as a protection against bombs dropped from overhead. Ghistelles is a safe base, as it is well beyond the range of the Allies' warships. Anti-aircraft guns have been mounted in large numbers."

A *Daily Telegraph* correspondent in Paris on Monday wrote:—

"M. Millerand, Minister of War, and General Gallieni and his staff this morning visited in the entrenched camp of Paris the head quarters of the defence organisation against Zeppelins. The head of this service showed to M. Millerand the working of anti-Zeppelin guns and of searchlights. Commander Girod, head of the aviation service of the entrenched camp of Paris, passed for the Minister's review the machines and their pilots. M. Millerand pronounced himself entirely satisfied with the measures taken and the results achieved.

"Within a short time the population of Paris will, through a communication to the Press, be advised of measures taken for a possible reduction of lighting in the capital. The warning is intended to obviate surprise or distress, in case of sudden alarm."

A *Daily Mail* correspondent, writing from Rotterdam on Tuesday, said:—

"A severe blow to German hopes has been caused by the great fire last night at Antwerp. The important oil works of Van Gorpen and Co. and Martens and Co. were entirely destroyed, together with food stores and twelve houses.

"The blaze was visible at Putten, on the Dutch frontier. The origin of the fire is a mystery. Travellers from Bergen-op-Zoom say that it was due to a bomb dropped by an aeroplane, but I cannot confirm this statement."

According to information obtained by the *Nieuwe Rotterdamse Courant*, the Germans are very busy building aeroplane sheds at Ghent and Brussels.

The following account of a foiled attack on Amiens was received from Paris on Tuesday :—

"Taking advantage of the fine weather, the Germans sent one of their Taubes to Amiens. A French aeroplane at once ascended and gave chase. The pilot succeeded in rising above the German. Between Cardolette and Querrieu a fight began, but did not last long, the German soon being seen to swerve. By a supreme effort he succeeded in righting his machine, but a few minutes later he crashed to the ground. The pilot on board, a lieutenant, was slightly wounded, and, after having his injuries attended to, was made prisoner. The observer, a captain, was killed, and the body was conveyed to the morgue. The German aeroplane was not badly damaged.

"A second Taube also made its appearance yesterday afternoon around Amiens, but it received such a warm greeting that it was speedily compelled to seek safety in flight."

The *Daily Telegraph* correspondent at Rotterdam wrote on Wednesday :—

"The *Berliner Allgemeine Zeitung* asserts, in headlines right across its front page, that London has been visited by the enemy's aircraft. 'German air attack against London; Zeppelin and squadron of aircraft over the Thames,' are the words which, in great black letters, attract at the first glance the attention of this newspaper's readers. Its introduction to a number of telegrams is as follows :—

"'After England has had to experience, through our cruisers and submarines, that though an island she is not by any means safe from attack, she has now to acquire the dangerous knowledge of how German bombs operate. Our aircraft has paid sea-commanding Britannia a visit, and afforded a new and brilliant proof of the bravery of our aeronauts. What we have heard of the appearance of German aircraft over Calais has been in effect that a squadron flew in the direction of Dover.'

"The Copenhagen correspondent of the *Allgemeine Zeitung* turns the matter the other way round. He says that a great German squadron of aircraft, at least sixteen strong, during the week-end visited the mouth of the Thames, probably with the intention of attacking London. The weather was, however, so unfavourable, because of fog and heavy rain, that the squadron flew along the coast until it reached Dover, where some bombs were thrown. Afterwards it proceeded in the direction of Dunkirk.

"We are asked to believe that this squadron consisted of fifteen aeroplanes and a Zeppelin.

"The *Berliner Tageblatt* is more cautious. Its version of the affair is that the squadron reached the Channel, with the intention of proceeding to England, but that, owing to delay caused by bad weather, it had to return in the direction of Dunkirk."

Another *Daily Telegraph* correspondent, writing from Boulogne on Wednesday, said :—

"Despite the severe régime imposed by the Germans, the Lillois are not without news. The Abbé Lemire has arranged on several occasions for the throwing by aeroplanes of copies of his paper, the



R.N.A.S. Officers Honoured.

IN the official announcement of the Investiture held by H.M. the King at Buckingham Palace on the 13th inst., it was recorded that among those who were invested by the King with the insignia of Companion of the Distinguished Service Order were Flight Commander J. T. Babington, R.N.A.S., and Flight Lieut. Sidney Sippe, R.N.A.S. It will be recalled that these officers, together with Squadron Commander Briggs, who is now a prisoner in Germany, took part in the air raid on the Zeppelin works at Friedrichshafen.

Locating the "Königsberg."

IN an account in the *Daily Telegraph* of the 11th inst. of the sinking of the German cruiser "Königsberg" as detailed by Captain Willett of the s.s. "Newbridge" there was the following :—

"The German cruiser had so effectively concealed herself not only amongst the palms, but by actually covering the ship with foliage, that it was impossible to locate her exact position. To get over this difficulty a steamer arrived on the scene with an aeroplane, and the position of the hidden cruiser was conveyed to the British by means of smoke bombs, and very quickly the big guns of our ships got the range and battered the Königsberg until she sank, and Captain Willett is of opinion that her crew shared the same fate."

Cri de Flandres, on to Lille, and the parcels were distributed by an inhabitant who picked them up. This continued until the Germans stopped it by confiscating the parcels.

"The *Nord Maritime* attempted, a short time after, to have copies thrown from an aeroplane, but the machine was greeted with such a dangerous fire from German machine guns that the idea had to be abandoned. The only paper that is sold in Lille, besides its own *Bulletin de Lille*, is the *Bien Public* of Ghent, which is also in German hands."

According to the *Echo Belge*, in view of the danger to the Zeppelin sheds caused by the air raids of the Allies over Brussels, the military governor has promised £1,000 to anyone capturing a hostile airman, dead or alive.

A *Daily Express* correspondent, writing from Geneva on Tuesday, said :—

"I learn from Friedrichshafen, by way of Romanshorn, that Germany has housed four of her latest types of Zeppelins, with a number of Taube aeroplanes, in the new aviation park which has been established near Ghent.

"It was from this point that the recent raid on Calais was made and from which the projected attack on Dover will originate."

According to a message from Cettinje, an Austrian aeroplane appeared over the city on January 9th and threw two bombs, one of which did not explode. The other destroyed a shop. Both bombs fell in the neighbourhood of the hospital, but no one was injured. Another Austrian aeroplane having flown over Budua, also came towards Cettinje. The Montenegrin batteries, however, forced it to change its course towards Cattaro. While passing over the village of Bieloche the hostile aviator threw three bombs. One of them failed to explode, and the others did no serious damage.

Mr. Percival Phillips, writing to the *Daily Express* from the Belgian frontier on January 12th, said :—

"A message reaching me here to-night from a reliable source states that a fleet of the Allies' aeroplanes which was sighted over the coast of North Flanders on Saturday dropped bombs on the new German air base at Ghistelles, near Ostend, the existence of which I announced yesterday.

"The damage caused is not known."

An officer of the R.H.A., in the course of a letter home, said :—

"But the best help of all are the aeroplanes; we had three of ours up to-day. One of our batteries is skilfully hidden in an orchard. We passed near it, but were afraid to approach close unless we might have been spotted from the distance and given away the exact position of guns and men."



Air Raids and London Schools.

AS a precautionary measure the Education Committee of the London County Council has issued a circular to teachers indicating what is to be done in the event of an air raid being attempted while the children are at school. Lessons are to be continued as far as possible in the normal way. Children are to be taken from the neighbourhood of windows where possible, but are not to be brought from upper floors to crowd classrooms on the ground floor or basement. Should the building be damaged the children are to be marched out into the school yard in the same way as in the case of fire in the building.

Fatal Accident to French Pilot.

ACCORDING to a correspondent of the *Matin* at Auzerre, a military biplane which was being flown by M. Lucien Couffin was caught by the wind and overturned, the pilot sustaining injuries which proved fatal.

An Italian Fatality.

ACCORDING to a report from Italy, Capt. Guiseppi Martinolo met with a fatal accident at Cameri, on December 27th, while flying a Gabardini monoplane.



Edited by V. E. JOHNSON, M.A.

Models Driven by Compressed Air.

(Continued from page 33.)
Heating the Air.

THIS point has already been dealt with to some extent, but there are one or two points to which further reference should be made. In the first place, the heating may be either direct or indirect. In the first case, the air from the reservoir in its path to the motor passes through a coil of tubing placed in the flame of a blow-lamp or vapour lamp, as the case may be. In the second case, the coil of metal tubing is surrounded by a suitable chamber or container nearly full of water, and it is this water which is directly heated by the lamp. As Mr. Hayden pointed out to the writer, in his case it would be impossible to use the direct or dry heat method because his leather cupwasher would at once shrivel up.

In the case, however, where no leather cups, &c., are used, even with soft soldering a very fair amount of heat could be used. Soft soldering is, I believe, generally considered to be capable of standing a steam pressure of 100 lbs., provided any flame is kept well away from the soldered joints, &c. Owing to press of other work, the writer is compelled to postpone the experiments he intended to make in this direction, but the subject is undoubtedly one well worth experimenting with, and he trusts there will be no delay in the matter, but that some of the readers of FLIGHT will be able to carry out a little research work in this direction. It is, of course, a matter for bench testing, and therefore quite independent of weather conditions, and also very appropriate work for this time of the year.

Soldering the Container.

In the original steel container made by the writer, the flux used was zinc and spirits of salt; in spite of every possible precaution, the container is now pitted with tiny pin holes and quite useless.

By using brass or copper this difficulty is overcome, but steel is still used in the form of the steel wire wound around the container: this should be soldered with "Fluxite." Fluxite is not so easy to use, but the writer has adopted a compromise by means of which the work can be done very quickly. For "timing" the soldering iron I use the old flux, and with a little streak of Fluxite smeared along the container and wire and the use of blowpipe solder, the soldering can be done very easily and quickly.

Two Methods of Making the Container.

There are two distinct methods of forming the cylindrical container: (i) by means of a straight longitudinal join or joins running from end to end, (ii) by means of spirally winding the metal foil on the wooden former. The latter method undoubtedly possesses some advantages, especially in the case when the diameter of the container would necessitate more than one longitudinal join. The method is also especially suited to the formation of the truncated cone type of container. It probably comes out rather the heavier of the two, but is undoubtedly the stronger.

Testing for Leakages.

This point has already been referred to, but I again raise it because I have reasons for believing that some consider it unnecessary to carry out a careful oil or water test. I can assure them that

they are absolutely mistaken; you cannot hear little leaks or even feel them, but their presence makes all the difference in the results you will obtain. It is absolutely essential the most rigorous tests be made in this matter, and nothing but absolute airtightness be permitted to pass.

(To be continued.)

Compressed Air Containers.

Mr. H. Leslie Young, writing with reference to the above, says:—

"It may be of interest to you to know that I have constructed a very successful container, 22 ins. long by 2½ ins. diameter, of very thin sheet tin, using copper half-balls (outside half) for the ends.

"The joint is just an ordinary overlap with a strip of tin about 1 in. wide soldered over it. I evolved this joint after making two containers with S joints, both of which proved unsatisfactory, owing to the fact that the joint leaked badly (no matter how much solder was put on) with more than 100 pump strokes. The first of these two containers burst down the seam with only 100 strokes.

"On the present container I have obtained 200 strokes, and I do not doubt but what more could be obtained, but I have not tried above this number so far.

"The duration obtained with 200 strokes (autoplan pump) is app. 40 sec. using a horizontally-opposed oscillating engine, ⅝ in. bore by ½ in. stroke, and a 12-in. Chauvière tractor. The engine was designed by Mr. H. J. V. Stevens (who is at present in training at Dorking with the Civil Service Rifles), and I think he is preparing a few notes on same to send to you.

"Below are particulars of cost of this container:—

"Thin sheet tin, 20 ins. by 14 ins., 4d.; 2 copper half-balls, 2½ in. dia., 6d. (3d. each); solder, wire, valve, and tap, 2s.; total, 2s. 10d. Length, 22 ins.; dia., 2½ ins.; weight (all on), between 9 and 10 ozs.

"I am starting on a much smaller plant, to weigh about 7 ozs. with a single-cylinder piston valve engine, ½-in. by ½-in., and container, about 18 ins. by 1½ ins., and I will let you have particulars with drawings when finished."

Aeromodellists Serving with the Colours.

Epsom Aero Club.

The Hon. Secretary of the above club, Mr. H. Ayles, Stanhurst, Epsom, writes us as follows:—

"Noticing that you wish to publish the names of aeromodellists serving with the Colours, I give below a list of members of the above club now doing so:—

"G. Butler, East Surrey (Territorials).

"W. Coleman, Royal Engineers.

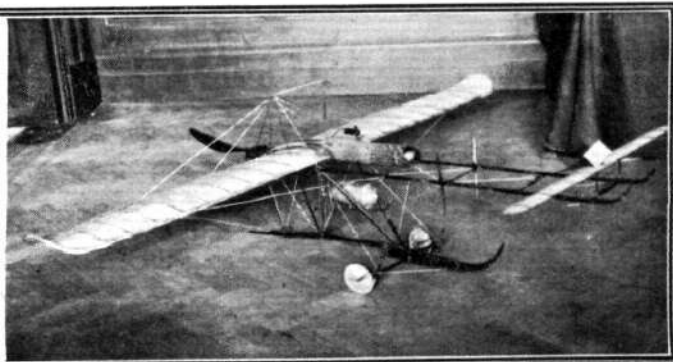
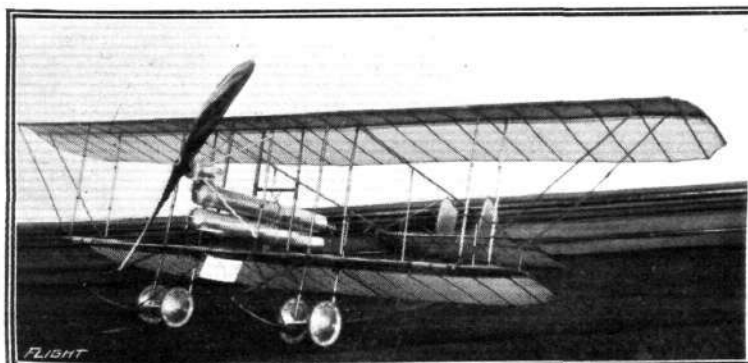
"F. C. Corket, Royal Engineers.

"H. Harlow, East Surrey.

"A. Sanders, 8th Hussars.

"The club has only been formed about six months, and the loss of these members reduces our numbers by nearly half.

"I shall be glad if any aeromodellists in this district who would care to join the club will communicate with me."



A CONTRAST.—A compressed air-driven Caudron biplane model by Messrs. D. Hiscox and C. Desoutter (on the left), and a flash steam-driven monoplane by Mr. H. H. Groves (on the right). Both are excellent examples of their respective types.

Finsbury Park and District Aero Club.

Mr. B. H. Barnard sends us the following communication :—
 "Members of the above club now serving with the Colours :—
 "R. Mullin, No. 2239, 12th Co. of London Rifles, B Company.
 "F. R. Steer, No. 125, 15th Royal Welsh Fusiliers, London Welsh Battalion.
 "F. Clay [regiment at present unknown]."

Tractor Troubles.

A correspondent has sent us the following letter in respect to troubles he has met with with regard to the first tractor monoplane he has built. With a view to obtaining more than one expert opinion on the matter, for not only his benefit, but probably others as well, we publish the communication below :—

"I have just made my first tractor monoplane, but it was not successful, when tested as a glider; it seemed to have good stability, making a long glide in a roughish wind, but when tested under power (rubber) it either executed a tail-slide or climbed steeply and stalled. It, however, rose off the ground quite well, no matter how the main plane was set, adjustment being made by shifting the main plane backwards or forwards. The machine had quite a pronounced longitudinal dihedral, a non-lifting uncambered tail, which was nearly in the line of thrust and parallel to it. Could you give me any tips about longitudinal stability on tractors? The extraordinary thing about this machine is that when gliding—which it does quite well—the c.g. is much nearer the back than the front edge, in fact, the model will not glide with it more forward. The machine is like a Morane-Saulnier in plan, but the angle of incidence and the camber get less towards the tips and there is a dihedral angle."

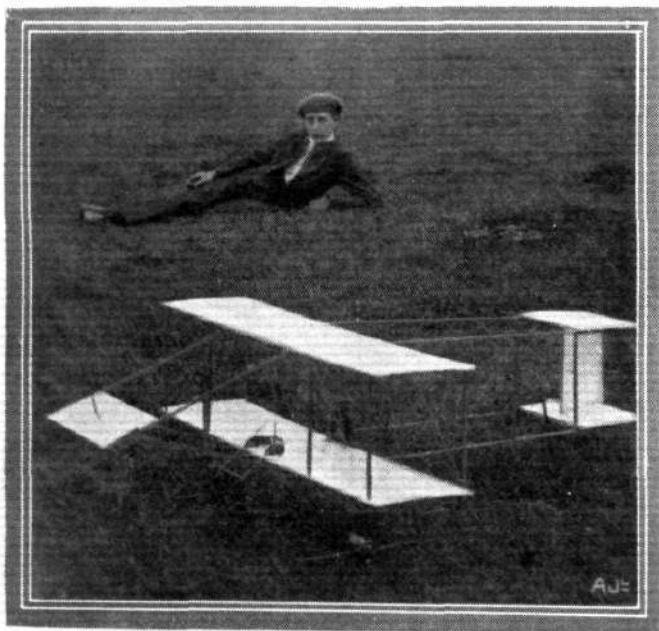
Our correspondent appears to have totally overlooked the effect of the slip stream from the propeller. Gliding tests do not apply to "tractors" like they do to "pushers."

Replies to Queries.

J. F. EDWARDS.—Your first idea was one of the earliest tried on vessels of the modern submarine type. It was put to a practical test first of all in America, but failed entirely. It is nothing like so easy to carry out as the torpedo method, which certainly cannot be regarded as lacking in efficiency. With respect to your bomb-dropping device, much more has been done in this direction than you imagine, and experiments are, of course, continually being carried out. There are also complications in the method you suggest, and in a matter of this kind simplicity is the essential feature. Needless to add, we are much obliged for your suggestions, but we do not think they would be likely to be adopted; more especially the first, which has been proved to be impracticable.

H. J. V. STEVENS.—There is no prospect whatever of such a paper being published, since it could only be produced at a heavy financial loss.

H. TOMLINSON.—We will see if we can accede to your request, but there are difficulties. We know of no suitable paper covering,



MR. H. METCALF'S EARLY FARMAN TYPE MODEL.—Total length 6 ft., weight 12 ozs., span 3 ft. 9 ins., height 1 ft. 8 ins., with single rudder between the tail planes.

and should certainly not recommend such. If you have some good clear photographs, by all means send some along with particulars.

J. CHAPMAN.—It depends entirely on the speed of your machine, i.e., on the motive power and loading per sq. ft. You can approximately rely on the following: To lift 8 ozs. per sq. ft. a speed of 17 miles per hour is necessary; to lift 1 lb., 25 m.p.h.; to lift 4 ozs., 12 m.p.h.; to lift 6 ozs., 15 m.p.h.; and to lift 21 ozs., 30 m.p.h.

H. SHAW.—You will find in the model columns of FLIGHT for the past three years the best supplementary knowledge. There are no recent publications in book form.

T. H. Y. TITCOMB.—We will publish your letter in an early number, and you will thus have the benefit of more suggestions.

AFFILIATED MODEL CLUBS DIARY.

Club reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).
 JAN. 16, annual general meeting at 89, Herries Street, Queen's Park, N.W., 9 p.m.

Records at the Grahame-White School.

Those who glance at the list of certificates granted by the Royal Aero Club, week by week, may have noticed that since the beginning of September, the Grahame-White School at Hendon has turned out 32 certificated pilots, 24 of these being officers of the R.N. Air Service. During the week ending December 21st, eight pupils obtained their *brevets* at the school, and this appears to be in the order of a record. A new school machine came out of the shop this week, increasing the fleet to four; another is in hand, and should be ready very shortly.

IMPORTS AND EXPORTS, 1913-1914.

AEROPLANES, airships, balloons, and parts thereof (not shown separately before 1910). For 1910 and 1911 figures, see FLIGHT, January 25th, 1912, and for 1912 and 1913, see FLIGHT for January 17th, 1914 :—

	Imports.		Exports.		Re-Exportation.	
	1913.	1914.	1913.	1914.	1913.	1914.
	£	£	£	£	£	£
January ...	12,097	5,945	4,005	210	1,510	879
February ...	17,361	28,132	3,447	106	690	441
March ...	20,425	27,731	1,924	1,934	1,042	1,440
April ...	15,593	11,384	5,524	1,175	1,413	1,473
May ...	31,241	17,062	3,726	4,059	830	9,484
June ...	14,905	15,967	1,408	5,082	1,106	142
July ...	14,469	15,548	3,812	4,994	1,250	1,695
August ...	17,993	52,448	2,805	630	510	910
September ...	19,409	4,859	6,263	—	1,470	—
October ...	21,041	39,287	3,674	325	2,163	—
November ...	16,607	24,598	3,306	141	1,449	104
December ...	22,955	32,298	6,851	1,031	1,439	—
	244,096	275,259	46,756	19,687	14,868	16,568

Aeronautical Patents Published.

Applied for in 1913.

Published January 7th, 1915.

24,163. N. P. BILLING. Alighting indicators for flying-boats, &c.
 27,584. H. COANDA AND J. H. HARDCASTLE. Range-finding from aerial craft.

Applied for in 1914.

Published January 7th, 1915.

8,533. P. H. SMITH. Aeroplanes.

FLIGHT.

44, ST. MARTIN'S LANE, LONDON, W.C.
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